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AUTHOR Tocatlian, Jacques
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ABSTRACT

This overview of the role of the General Information Programme (PGI) in Major Program VII: Information Systems and Access to Knowledge, one of 14 major Unesco program areas for the period 1984-1989, includes the goals of the program, a review of issues and problems in the area of information technology applications in developing countries, and a description of PGI activities in this area. It is noted that the program has been designed to (1) facilitate general access by and flow of information among member states, especially the developing countries, for supporting their development program; and (2) to enhance the capacity of member states to exchange, store, process, and use information in their development activities. Issues and problems discussed are concerned with management of database and information systems development; hardware options; software options; data communication facilities; national socio-political, economic, and cultural factors; and information policy. The role of PGI is then described in the context of a general framework of activities; overall strategies for increasing awareness, training of specialists, and infrastructure projects incorporating information technology; and examples of activities for promoting information technology applications in developing countries vis-a-vis the problems and issues enumerated in the previous section. This paper based on a presentation by Jacques Tocatlian includes a brief reference list. (BBM)

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PROMOTION OF INFORMATION TECHNOLOGY APPLICATIONS IN THIRD WORLD COUNTRIES : PGI'S ROLE

1. INTRODUCTION

The paper by Jacques Tocatlian indicates that Major Programme VII : Information Systems and Access to Knowledge, one of the fourteen major programme areas into which Unesco's activities are to be channelled during the Second Medium Term Plan period (1984-1989), has been designed to :

- facilitate general access by and flow of information among Member States, especially the developing countries, for supporting their development programmes ; and

- enhance the capacity of Member States to exchange, store, process and use information in their development activities.

A guiding principle of the programme is the enhancement of the self-reliance of and technical cooperation among, developing countries. Within this framework, based on the experience gained in the seventies and during the 1981-1983 plan period, PGI is placing emphasis on :

- operational activities ;
- promotion of the applications of technology in information handling ;
- use of numerical, statistical and other factual data and systems needed for the purpose ; and
- information analysis, consolidation and repackaging to meet different user requirements.

Computer science and related technologies have become integral part of scientific and technological research. They are influencing the transformation and reorganization of several areas of human activity, for example : administrative data processing and computer-aided management ; computer controlled machine operations and manufacture ; computer-aided design ; office automation ; computer-aided instruction ; electronic publishing, etc. Such activities are spreading slowly but definitely in several developing countries and, no doubt, they influence directly or indirectly information technology* applications in library and bibliographical information work. However, it is to be noted that in the activities under PGI, information technology is essentially a means or tool applied to one of the many fields in which it can be applied, namely, to library work and processing of information to facilitate the flow and access to information.

Information technology (IT) applications in developing countries currently include :

- library applications such as circulation control, documents acquisition management, serials control, cataloguing, preparation of union lists, word processing, generation of directories and reports ;
- information services applications such as referral, SDI, retrospective search ;
- preparation of local data bases, some of which may be used in the library documentation and information services mentioned ;
- on-line access to remote data bases using national and international telecommunication networks.

Computer messaging systems, electronic mail, teleconferencing, videotex, etc. have been successully experimented on.

The developments are encouraging and should be fostered. In this context, there are some issues, problems and challenges that require early attention from all concerned lest they become, in the long run, constraints to cooperative activities in the information field. The next section briefly discusses these issues.

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* The term 'information technology' as used here denotes the combination and integration of computer technology, telecommunications, audiovisual technology and graphics technology applied to information processing and management.

2. ISSUES, PROBLEMS AND CHALLENGES

The issues and problems in the area of information technology applications in developing countries relate mainly to :

- management of database and information systems development ;
- hardware options ;
- software options ;
- data communication facilities ;
- national socio-political, economic and cultural factors ; and
- information policy.

2.1 Management of database and information systems development

(a) In many cases local database activities and information systems are planned and developed by data processing personnel with little or no input and participation of information personnel. This results in systems that are not adequate for library and information work and non-standard with limited potentia for systems interconnection and information exchange.

(b) Often the information users (end-users) are given little opportunity to interact with system designers and make inputs at the different stages in the planning and development of the systems. As a result, few of the locally developed systems are really "user-friendly".

(c) Few of the local systems have built-in mechanisms to collect data on the use of the data bases and problems thereof. Such data are important in planning information use promotion activities, information services marketing, information policy formulation, for systems development and for securing the commitment of management to support and promote information systems.

(d) In many developing countries post-sales services and maintenance of computer hardware, supply of spare parts, tapes, discs and cassettes and provision of other logistic services are not satisfactory. Problems due to the frequent shut down and failure of electricity supply, considerable fluctuations in voltage, and humid, dusty and poorly ventilated and air-conditioned environments have to be reckoned with.

(e) Studies have shown that information and information services are underutilized in many institutions in developing countries. The reasons are many and complex. One of them is the lack of or poorly done information use promotion and information marketing activities oriented to the different categories of users. Development planners may not be sensitized to the factors influencing the development of effective and efficient information systems ; consequently they may not give a high priority and allocate adequate funds to information systems and services.

2.2 Hardware options

a) There are several types and brands of computers in the mainframe, mini-, and micro-series on the market. Some countries import and distribute under the same name as the original ; others distribute under different labels some computers are locally assembled ; a few are locally produced. National considerations, price, pressure of sales tactics, quality standards, etc. complicate the choice of hardware.

b) In some cases there is a vendor "lock-in", that is dependency on the hardware of a single vendor. There may be no other option in a country ; on the other hand, sometimes, the problem arises because the choice of hardware is left to the data processing personnel without taking into consideration of the needs of library and information processing requirements. Such dependency could restrict future development possibilities.

c) Some developing countries have regulations on hardware acquisition from abroad or those produced locally. On the other hand, there are also restrictions and conditions imposed by countries on supply of computer hardware and software to other countries. Such regulations could limit the options for an institution to obtain the more suitable hardware for library and information processing applications.

d) There is an influx of microcomputers on the market in developing countries. These being relatively less expensive many library and documentation centres are procuring them for their own use. The issues discussed at (a) to (c) also apply equally to the use of microcomputers. Perhaps the problems are much more visible and widespread now. Sales competition among microcomputer vendors sometimes results in institutions getting low cost equipment or even donated equipment which may not be the more suitable ones for application of appropriate software packages and compromises in system design and software selection have to be made.

2.3 Software options

a) Software packages obtained from outside, especially those prepared for other data processing work, are not at times adequate for library and bibliographic information work ; modifications may be necessary to suit local requirements and conditions and this can be expensive in addition to the cost of procurement of the original package. Some of the packages do not incorporate international bibliographic standards or can be implemented only on particular computer models. These factors limit the choice among market-supplied software packages. Also, until recently adequate information on the software packages more suitable for library and information work, was not available. Hence, institutions in developing countries have tended to develop their own applications software. They also perceive a need to develop local capability in applications software design.

b) Software developed in-house in developing countries rarely incorporate existing bibliographic standards ; they lack portability, and have limited database management capability and user-friendliness features. This situation

again is partly due to the data processing personnel involved in software design not being fully aware of the needs of information and data exchange, resource sharing, networking and other cooperative activities in library and information services.

c) For those who wish to obtain (or develop) good software the question is what criteria to apply, and non-availability of adequate information on good model software packages, and need for expertise in system design, software engineering, etc.

2.4 Data communication facilities

a) At present in most of the developing countries the national telecommunications infrastructure, especially public data communication networks, needs considerable improvement and upgrading of the technology to meet the growing demand for communication facilities in all sectors of the national economy. Such an infrastructure is vital for future networking, information and data communication and sharing.

b) Systems are often not designed to be accessed by remote slow speed terminals. In developing local data bases access by a variety of terminals need to be ensured.

c) High telecommunication tariff rates discourage use of the facilities for information access, retrieval and exchange.

d) National policies and planning relating to telecommunications development do not always give adequate consideration to the requirements for digital data communication.

e) Exchange of data in machine-readable form (e.g. magnetic tape, microcassette) across national boundaries may encounter restrictive customs and postal services regulations. Something similar to the Florence Agreement for printed materials is needed to cover other media used in data transfer.

f) There are instances of the use of locally created hardware interface rather than the standard interfaces and protocols. This adds to the problems of systems interconnection.

g) Establishment in developing countries of online access to data bases abroad, use of microcomputers for downloading segments of data bases accessed, and various other forms of data and information transfer will soon have to contend with the variety of issues and regulations relating to transborder data flows.

2.5 National geo-political, economic and cultural factors

The national information infrastructure is an integral part of a country overall development infrastructure ; each influences the other. The information infrastructure has to fit into and operate within, the framework of a certain geo-political, economic and cultural milieu. The socio-political, economic and

cultural characteristics of the country influence and are reflected in, the information infrastructure. Thus, the development of information technology applications in the information infrastructure of the country is influenced by such national factors as :

- the general level of development - e.g. in education, research and development, industrialization, commerce, and other sectors of the economy ;

- the general attitude of the government and the private sector to the application of technology in human activities ;

- the perception of the work force on the types of impact that the introduction of modern technology will have on their respective work areas and how well the authorities are prepared to allay the false fears and mitigate the undesirable effects of new technology and are able to handle the transition problems without social unheavals ;

- the extent and rapidity with which technology education in general and computer literacy in particular is introduced and spreads ;

- the extent and rapidity of development of information-intensive sectors/activities (e.g. business and commerce, research and developme: etc.) ;

- the pace of development of the information industry in the country ;

- the level of and regulations relating to, import of technology in the country.

These geopolitical and development factors have to be kept in mind in attempting to promote information technology applications in developing countri which are at different stages of development and have different socio-political economic and cultural structures.

Closely related to national cultural factors is the need to provide for the handling of information records in a variety of languages and in non-Roman scripts. There is also genuine desire to do things in the country itself rather than import, seen as the more appropriate way of fostering self-reliance.

2.6 Information policy

Several of the issues discussed in this section relate to the lack of national/institutional mechanisms to coordinate and take into account the needs and interests of several different groups - e.g. information users, information intermediaries, information specialists, computer, telecommunications and related technologies, national socio-political, economic and cultural factors, in the planning for introduction and development of information technology applications. A national policy on information could help, but in many developing countries it does not exist. Therefore, information technology applications in the country become ad hoc and uncoordinated making cooperative activities difficult.

3. PGI ACTIVITIES FOR PROMOTING INFORMATION TECHNOLOGY APPLICATIONS

3.0 General framework

PGI is aware of the problems just mentioned and of their complexity. With limited resources in relation to the requirements of Member States and within the framework of international conventions and procedures, PGI has been contributing to the solution of the problems. It does not pretend to have solutions to all problems of all countries. As societies evolve and change some issues become less important, while others compel immediate attention and new issues emerge.

The principal role of PGI is to act as a catalyst in sensitizing Member States to the problems and issues involved, identify opportunities for action and coordinate activities at national and international levels in the attempts to find solutions to the problems. It performs these functions through consultations and collaboration with other units of Unesco, the Member States, the United Nations and its specialized agencies, inter-governmental and non-governmental organizations and individual specialists. PGI's activities in the promotion of IT applications, as in other programme activity areas, are advised on and reviewed by expert groups, and approved and mandated by the PGI Intergovernmental Council and Unesco's General Conference.

PGI activities for the promotion of IT applications are obviously closely linked to and draw from, the projects and activities of the three subprogrammes, mentioned in Mr. Tocatlian's presentation, into which Major Programme VII is divided. Thus, the first subprogramme provides for a continuation of efforts made earlier to develop technical and normative tools helpful in establishing library, documentation and information services, their interconnection and networking for sharing and exchanging of information resources. This is seen to be particularly important in designing systems to ensure optimal use of new information technologies in developing countries. The second subprogramme which provides for the strengthening of libraries, information, data and archives centres, systems and services of all kinds, including the promotion of information policies and education and training of information personnel and users, constitutes the infrastructure for the implementation of information technologies.

Again, as in other programme activity areas, IT applications are promoted in a number of ways. For example :

- through support of consultancy and advisory missions to Member States or specific institutions to assess current situation, to prepare feasibility studies, or to advise on implementation of specific project activities ;
- provision of fellowships for training ;
- supporting infrastructure development including implementation of computer facilities, information processing activities, database development, online access, etc. ;

- organizing and supporting seminars, workshops, training courses, demonstrations, etc. to facilitate exchange of information and experiences and technology transfer on IT applications ;
- financing the procurement of equipment, such as microcomputers and reprography equipment, teaching aids, etc. within the limits of available resources ;
- supporting the development of guidelines, norms and standards, portable software packages, etc. usually in collaboration with other organizations ; and
- negotiating with organizations and institutions for obtaining facilities on favourable terms to developing countries.

3.1 Overall strategy

PGI's overall strategy in this area may be said to be based on three key concepts :

- increasing the awareness of Member States about developments in the field
- supporting training of specialists in modern methods of information handling ; and
- promoting/supporting the actual use of information technology in given national/institutional infrastructure.

3.1.1 Increasing awareness

PGI supports the preparation and dissemination of study reports and other documents on various aspects of information technology. These may be of the following kinds :

(i) general information materials useful for updating information personnel or for use by students of information technology, for example :

- Application of Minicomputers and Microcomputers to Information Handling, prepared by José-Marie Griffiths. 1981 Nov.
- The Use of Satellite Communication for Information Transfer, prepared by the International Institute of Communication. 1982 Feb.
- Lineas Directrices para la Planificacion y el Establecimiento a Nivel Nacional de Redes de Teledocumentacion, prepared by the Fundacion de la Red de Informacion Cientifica Automatizada (FUINCA) Madrid. 1983 July (to be released shortly).
- Compatibility Issues Affecting Information Systems and Services, prepared by F. Wilfrid Lancaster and Linda C. Smith. 1983. Sept.

(ii) Publication (in English, French and Spanish) and wide dissemination of the periodical Unesco Journal of Information Science, Librarianship and Archives Administration. The Journal not only published articles on information technology in general but also experiences in using technology in developing countries. Unfortunately, due to financial constraints, the journal had to be discontinued in December 1983.

(iii) Project or mission reports, though relating to a specific region or project, but with wider interest and applications. For example :

- A proposed Common Format for Existing and Projected Computerized Bibliographic Information Systems/Caribbean region/... prepared by Harold Dierickx. 1983.

(iv) Reports and technical materials based on experiences in specific Unesco projects but of wider interest and applications. For example :

- Online Access to Remote Data Bases : An Experiment in User Sensitization by A. Neelameghan and Ma. Divina Pascua-Cruz. J. Infor. Sci. 7 (1983) 107-115.

3.1.2 Training of specialists

For PGI, activities for the education and training of information specialists and users is a priority area. Suffice to mention here that in recent years the training activities have in an increasing number of cases included information technology applications. The personnel training may relate to a specific library automation or online access project : or to use specific hardware and software ; it may be a seminar, workshop, demonstration, or short course on some aspect of information technology - e.g. preparation of local data bases, online access, microcomputer applications, etc. or development and implementation of a course module in information technology in a graduate programme in information studies ; or development of teaching aids for information technology; or provision of equipment and software packages for use in training.

3.1.3 Infrastructure projects incorporating information technology.

Again, in recent years, an increasing number of infrastructure development projects in Member States executed by PGI either out of its own Regular Programme Budget or using extrabudgetary sources, include information technology application components, such as missions to advise Member States on the planning, design and implementation of computerized systems, hardware an software selection and procurement, negotiations with suppliers, vendors and other agencies ; evaluation of computerized systems, etc. ; or assess data communication facilities and potential in a country or in a region.

4. SOME SPECIFIC ACTIVITIES

Within the general framework and overall strategy mentioned, the following are examples of specific activities of PGI in promoting IT applications in developing countries vis-à-vis the problems and issues enumerated earlier in the presentation.

4.1 Norms and standards

Promotion of the adoption or adaptation of existing norms and standards or supporting the formulation of new ones as may be necessary for information handling, e.g. :

- guidelines for the preparation of monolingual and multilingual thesauri to ensure a first level of structural compatibility among indexing languages used in local data bases ;

- UNISIST Reference Manual for machine-readable bibliographic descriptio and for the description of research projects and institutions, to ensure compatibility in record formats ;

- a Common Communication Format for the exchange of information in machine-readable form ;

- UNISIST Guide to Standards for Information Handling, including those applicable to computerized systems.

4.2 Software

PGI-UNISIST International Inventory of Software Packages in the Information Field (1983) is a useful tool for identifying software packages for specific information work and for use on specific types of computer.

There are software packages suitable for retrieval and management of bibliographic and numerical information and library work. Few of them, however, meet all the requirements ; they are expensive for developing countries ; some are implementable only on specific brand of computers ; others require modifications to suit local conditions and requirements. A few packages of general utility can be obtained under interesting conditions for developing countries - e.g. the CDS/ISIS developed and maintained by Unesco, runs on IBM main frames and compatible machines, and is provided free of charge to Member States along with training and installation. The MINISIS developed by the International Development Research Center of Canada, runs on HP 3000 series of mini-computers and is provided free of charge to developing country institutions.

The use of microcomputers in library and information work is spreading in developing countries. But most of the software available have been developed for specialized small-scale applications. Only a very limited number of generalized packages making use of the potentials of larger micro-computers are available under terms that encourage their wide use in developing countries Therefore, in its Second Medium Term Plan, PGI has given priority to support the preparation of a generalized software package for micros adequate for a variety of library and information service applications. The core package (2) tested in different institutions provides for local input and output and data base management. Basic communication functions (asynchronous communication through modems linked to telephone lines or packet switching networks) and format conversion would be part of the general input and output

functions. The core package is also developed to handle a number of library functions. During 1985-86, several other functions will be added. The software, which will be made available to developing countries under interesting conditions, is made portable on a variety of micro-processors (Z80, Z80A INTEL 8088, 8086, LSI11) with or without the usual operating systems such as PC/M and MSDOS. The architecture of the system is such that the only interface of the standard software package with the hardware is at the level of the p-code (pseudo-code) interpreter which reacts directly with the micro-processor. The new development in CDS/ISIS for use of the software on mini- and micro-computers is the subject of another paper to this meeting.

4.3 Hardware and logistic services

With a view to assisting institutions in developing countries in the selection of computers and other information handling equipment, PGI is providing support to the International Centre for Information Handling Equipment (IRCIHE) in Zagreb, to prepare an inventory of logistic services (including supply of spare parts, engineering and consultancy services) for computers and related equipment and basic guidelines for the installation and maintenance of such equipment. The directory and guideline are expected to be available in the next few months. An international seminar on logistic services is foreseen for 1985.

4.4 Telecommunications

The status of telecommunication facilities and data communication/public data networks in a number of developing countries is being studied with a view to formulating projects and programmes for the development of such facilities essential for systems interconnection and information exchange.

Also, in association with other sectors of Unesco, PGI has been considering issues relating to telecommunication tariffs.

4.5 Global issues

The Second Medium Term Plan provides for study, in association with other organizations, of some of the special problems relating to the use of information technology - e.g. information overload, obstacles to the efficient use of technology, barriers to online access to information and data, the impact of electronic publishing, transborder data flow issues, etc. - especially in the context of developing countries and their interactions with the industrialized countries.

4.6 Information policy

PGI has been assisting Member States in the formulation and adoption of national information policies. More attention will be paid to cover policies relating to information technology applications, telecommunications development and related matters.

4.7 Regional approach

A regional approach is helpful in certain programme activities to supplement national programmes. Activities to promote information technology applications appear to be suitable for a regional approach. Reasons for the regional approach in PGI activities include :

- the possibility for more productive use, through sharing among several countries, of the limited international assistance available ;
- the opportunity for stimulating self-reliance and mutual assistance among developing countries in a region, especially where a framework for cooperation in the political, economic, scientific and cultural fields already exists ;
- sharing of experiences and expertise among the countries in the use of information technology whether locally developed or obtained from abroad.

5. CONCLUDING REMARKS

This brief presentation, I hope, has indicated to you some of the problems and issues relating to information technology applications in developing countries as perceived by Unesco from its experience in developing information infrastructures in those countries ; as well as the general framework, the overall strategy, and some specific types of activities of the Organization in attempting to help Member States to find solutions to the problems. Obviously, the effectiveness of international action will largely depend on the extent of cooperation received from Member States - both developing countries and developed countries. By and large, this has been satisfactory. In its efforts to promote the use of IT applications in developing countries, Unesco looks forward to the furtherance of such cooperation.

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